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#### SCIENCE OBSERVATIONS ON DEEP SPACE ONE

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During the Deep Space One (DS1) primary mission, the spacecraft will fly by asteroid 1992 KD and possibly comet Borrelly. There are two technologies being validated on DS1 that will provide science observations of these targets, the Miniature Integrated Camera Spectrometer (MICAS) and the Plasma Experiment for Planetary Exploration (PEPE). MICAS encompasses a camera, an ultraviolet imaging spectrometer and an infrared imaging spectrometer. PEPE combines an ion and electron analyzer designed to determine the three-dimensional distribution of plasma over its field of view.

MICAS includes two visible wavelength imaging channels, an ultraviolet imaging spectrometer, and an infrared imaging spectrometer all of which share a single 10-cm diameter telescope. Two types of visible wavelength detectors, both operating between about 500 and 1000 nm are used: a CCD with 13-microrad pixels and an 18-microrad-per-pixel, metal-on-silicon active pixel sensor (APS). Unlike the CCD

the APS includes the timing and control electronics on the chip along with the detector. The UV spectrometer spans 80 to 185 nm with 0.64-nm spectral resolution and 316-microrad pixels. The IR spectrometer covers the range from 1200 to 2400 nm with 6.6-nm resolution and 54-microrad pixels

PEPE includes a very low-power, low-mass micro-calorimeter to help understand plasma-surface interactions and a plasma analyzer to identify the individual molecules and atoms in the immediate vicinity of the spacecraft that have been eroded off the surface of asteroid 1992 KD. It employs common apertures with separate electrostatic energy analyzers. It measures electron and ion energies spanning a range of 3 eV to 30 keV, with a resolution of five percent, and measures ion mass from one to 135 atomic mass units with 5 percent resolution. It electrostatically sweeps its field of view both in elevation and azimuth.

Both MICAS and PEPE represent a new direction for the evolution of science instruments for interplanetary spacecraft. These two instruments incorporate a large fraction of the capability of five instruments that had typically flown on NASA's deep space missions

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